ABSTRACT

Milk farms have faced a significant problem of decreasing dairy cow fertility and subsequently productivity in recent decades. This decline can be attributed to a number of factors such as poor genetic improvement, inadequate nutrition, poor reproduction management, the use of inappropriate breeding technologies, increased incidence of nutritional, metabolic and obstetric diseases, and poor animal welfare. Ensuring animal welfare in livestock farms is a complex and current issue that influences genetic progress and technological and productive progress. New farms have emerged in this framework and in Romania recently, which have modern systems of maintenance of dairy cows that meet European standards and requirements.

Many older farms have improved in terms of technology, equipment used in shelters, food preparation and distribution, fertilizer management and overall maintenance systems that tend to align as closely as possible with welfare requirements. The doctoral thesis is structured into 2 main sections: 1) the study of literature and 2) own contributions. The first section provides an overview of the history and importance of the Black spotted Romanian breed, from its synthesis to the present day, followed by details on the systems and technologies of breeding cows in dairy farms, as well as the phenomena that morphologically and physiologically underpin breeding and, implicitly, milk production, in cattle.

Although there is a significant variability in productive and reproductive performance at the subpopulation and individual level, this breed is superior to other breeds of cattle in our country, but inferior to those in the country of origin. The spread area is represented by the plains in the southeast and southern part of the country, as well as the lower and hilly areas of Moldova. In the future, Romanian black spotted will remain the main supplier of milk on the domestic market. Consequently, it is continuously improved with genetic material from the HolsteinFriesian strain. Milk production is in the direction of improvement; 90 % of the share of economic characteristics is oriented towards milk, and 10 % towards persistence of lactation, ease of reproduction and fertility.

The main improvement targets are a waist of 133-135 cm, a body weight of 650 kg, a milk productive potential of over 6000 kg per lactation, a reduction in specific consumption and an improvement in mechanical milking capacity. 20 Intensification is needed in increasing labor productivity in the dairy cow farming industry, improving the managerial act and equipping the workforce with high-efficiency production technologies. There is a need to create rational sizes of agricultural and zootechnical farms. This should be done taking into account the specific conditions of the area and local, as well as the current needs of management, productivity and economic efficiency of production.

The most economically cost-effective option is the intensive system exploitation of dairy cows, as it concentrates a large herd of animals with high genetic value and capable of producing a large amount of milk to meet the growing market demand. This system takes advantage of all the advantages of a mechanized and automated technological flow, which also requires skilled personnel. The production concentration process also involves the prudent exploitation of land surfaces to obtain maximum quantities and superior quality of feed. In addition to processing and marketing milk, these farms use an integrated management system. Stock feeding is used in the intensive system, which uses high-quality voluminous feeding as the basis of the ration and does not exclude seasonal feeding. It turns out that the fertility season, milk production, the number of lactations and reproductive diseases can affect reproductive performance. Management practices may have an impact on the incidence of gynecological conditions, the range of service and the number of seeds per conception. Milk cows have faced a significant problem of decreasing dairy cow fertility in recent decades. This decline can be attributed to a number of reasons, including genetic improvement, inadequate nutrition, inappropriate breeding management, the use of improper breeding technologies, increased incidence of diseases and poor animal welfare. Fertility is affected by gynecological conditions, which are best reflected in reproductive measurements. Low levels of reproduction indicate a lack of reproductive activity. These indicators include overage at the first fetus, interval between fetuses, breast rest period

and service period). Although significant progress has been made in growing dairy cattle, there are still many aspects that are not fully clarified in the interconnected system of technological – reproductive – productive factors.

Despite the fact that numerous studies have sought to understand the impact of technological factors on the breeding and production of dairy cows, it has not yet been reached a definitive solution that meets the desires of year breeders to higher yields at lower costs and full year animal welfare. Since the breeding capacity of dairy cows in farms is influenced by a multitude of factors and of a diverse nature that must be considered, I consider that any study addressing this subject is useful in order to clarify some of the problems 21 facing the zootechnical sector, with a view to increasing milk production, both quantitatively and qualitatively, while respecting animal welfare rules and the economic profitability of the farm. In this context, the aim of the doctoral research was to a partial contribution to the knowledge of the influence of technological factors on the well-being of dairy cows, the welfare subsequently reflected in the capacity for breeding and production. In particular, the aim of the doctoral thesis was to investigate, centralize, analyze and compare the results of eight small and medium-sized zootechnical farms in the northeast of the country using different maintenance systems, in terms of quantitative and qualitative performance of milk production, the main reproductive indicators and some reproductive problems.

The research was conducted in the following dairy farms over 4 consecutive lactations in 2018-2021: - Farm S.C. Polena S.R.L., Iaşi; - Farm of the Dancu Cattle Research Development Station – Iaşi; - Farm S.C. AgroTica S.R.L., Vaslui; - Farm of AgroInd Berezeni, Vaslui; - Farm P.F. Hinganu Vasile, Suceava; - Farm P.F.A. Flutur Mihai Alexa, Suceava; - Farm P.F. Pali Viorel, Botoşani; - Farm S.C. Milk S.R.L., Botoşani. The biological material was represented by 1251 dairy cows of the Romanian black spotted breed. First, for the year achieving the proposed goal, the growing technologies used in each farm were examined. This study emphasized the maintenance of henchmen, the exploitation of dairy cows, and the raising of female youth. Data on reproductive activity and milk production were then collected, processed and analyzed. Evaluations of production performance, successive lactation and farms concluded the following: The breeding of dairy cows in the eight farms taken in the study, knows some peculiarities, which differ depending on the farm, the genetic value of the animals, the feed base and feed supply, the technology of exploitation and the degree of technical and material equipment of the labor force and the mechanization of the work on the technological flow, but also in terms of the capitalization of farms, the way of processing and valorization of productions or even existing traditions. All these peculiarities are reflected in the productive and reproductive performance achieved during the study period. In terms of productive and reproductive performance, the Romanian black spotted taurine population, of the eight farms, comprises nuclei with a high genetic value, as a result of the breeders used and the favorable influence of environmental 22 conditions and technology of exploitation. Nevertheless, a detailed analysis of the technological factors in each farm and the management practiced, also highlights some shortcomings that have an impact, in particular, on the reproductive indices and animal health. The analysis of the intrapopulational structure revealed the existence, within each farm, of a number of genetic families of paternal semisisters with high production and reproductive performance, characteristics correlated with good physical development and a corresponding precocity of production and of reproduction. The need for reproductive identification and isolation of these genetic structures in order to multiply valuable genotypes and their exploitation under improved housing, feeding and care conditions as a result of the modernization of these farms is imperative. From the analysis of milk production indices achieved in the farms studied, it is observed that they were superior for all farms, with the following two in the top: SCDB Dancu, Iasi; AGROIND Berezeni, Vaslui The duration of total lactation for the entire population of Romanian black spotted cows was between 358.75 days (lactation IV) and 391 days (lactation III), exceeding the optimal value of 305 days. This prolongation of the duration of lactation is also caused by the establishment of later gestation, respectively by an extension of the uterine rest period, as well as by the tendency of breeders not to interrupt lactation after 305 days for cows with high milk production. Comparing the

productive performance of Romanian black spotted cows on farms, we observe that the core of the SCDB Dancu farm, Jud. Iaşi produced over 8734 kg of milk on average per total lactation, followed by that of the farm AGROIND Berezeni (over 7800 kg, on average, per lactation). The differences between farms have exceeded the significance thresholds, so there is a more than 95% probability that the improved technological system will influence quantitative milk production. Qualitatively, the core in the Dancu farm found very good values in terms of fat content (over 4.1%) and protein content (more than 3.4%). With regard to the quality of milk, significant differences (p < 0,05), distinctly significant (p< 0,01) and very significant (P < 0,001) were obtained when comparing between farms, for the fat content, between medium-sized farms but without significance between small farms suggesting that nutrition optimization affects this parameter. In contrast, the percentage of milk protein was not influenced by the technological system or the size of the farm. Reproductive activity was assessed in each of the four farms, at different lactations, using the main reproductive indicators. When examining the breeding indicators of cows in the farms studied, numerous deviations from the values presented in the literature were found. One of 23 the main causes of these deviations was a series of management measures that were not implemented correctly. Thus, the age at the first generation, although considered good, slightly exceeded, up to 0.5 months, the optimum of the breed (27 months). It was observed that in farms with lower herds (PFA Flutur and MILK SRL), the age at the first generation was below this threshold. The interval between incubations (CI) on successive lactations had an average of 416,57 days per total population, thus exceeding the optimum value of 400 days, resulting in significant losses of cattle and milk, i.e. significant economic losses, with an impact on the profitability of the farm. Dry period (RM) had an average value of 61.38 days, for the entire population studied, close to the optimum of the breed (60 days), but there were many situations when it was not established correctly, on the one hand due to the high production of milk, and on the other hand, because of the failure to install gestation in time and in farms with smaller stocks was even lower than the optimal value. Service period or uterine rest period (SP) had an average value of 134.46 days, much higher (with 2 months) than the optimal limit (80 days), having multifactor causes, related to both human factor and animal health. Cows that are difficult to fertilize are excluded from the herd after a lactation or two. Reproductive capacity is influenced by a number of genetic, environmental and technological and managerial factors. In this regard, the study demonstrated that, losses caused by the state of infertility – sterility in the farms studied are important, and vary from one farm to the other, depending on the biological material, technological factors of exploitation and the management of the reproductive function. The fertility of the Romanian black spotted cows is mainly influenced by the poor management of the breeding function applied in the farm, which has resulted in more or less exceeding all breeding indicators, from a farm with an exploitation corresponding to scientific norms. When the eight farms were compared in terms of breeding characteristics, it was found that the age at the first calving does not differ significantly, regardless of the size of the farm or the more advanced or weaker technological level. However, the breeding rank has differentiated significantly (p < 0,01) or substantially (p< 0,05), between small and medium-sized farms, suggesting that some improved technological conditions will lead to better values for this parameter. In terms of breast rest and service, most comparisons have exceeded the significance thresholds of 99% (P < 0.01) and 99.9% (P< 0.001), suggesting that these reproductive traits are quite difficult to manage and are on a terrain that can be improved. Both parameters are crucial when considering the effectiveness of a dairy farm, considering that more fertile gestations and shorter breast breaks during productive life give dairy cows efficiency. 24 The results obtained in the eight farms are the results of the influence of technological and managerial factors on reproduction, the genetic value of biological material, the environmental conditions and well-being that were ensured in the exploitation. Synthesizing the results of research conducted in the taurine populations of the four farms taken in the study, we can draw the general conclusion that Friesian spotted dairy cows are well adapted to the environmental conditions specific to each farm. Production and reproduction performance are differentiated and express the influence of exploitation technologies and the genetic value of biological material. Particularly notable is the Dancu SCDB farm, where the highest production and

reproduction performance was achieved. The results obtained and the conclusions drawn from the research conducted on the taurine populations Romanian black spotted – Holstein – Friesian, from the eight farms in Moldova, can serve, to the extent that decision-makers involved in the management of dairy cows farms will consider that it proves its necessary practical usefulness, as an element of knowledge of the reproductive capacity and the technological influence of exploitation on production and reproductive performance. The results of research conducted in the eight taurine populations show that Friesian Spotted milk cows with Romanian black are adapted to the different environmental conditions of each farm, and the large variation in their production and breeding performance reflects the impact of exploitation technologies and the genetic value of biological material.

The work demonstrates its usefulness in practice, and the results and conclusions can help to understand the ability of biological material to adapt to different conditions of exploitation, specific to small and medium-sized farms, where there is continuously ground for improvement of technological systems, applied nutrition and welfare conditions. I would like to express my gratitude to the Doctoral Director, Prof. dr. Ioan GÎLCĂ, for the excellent scientific tutoring and human mentoring, but I also want to thank all my colleagues at the Faculty of Animal and Food Sciences, at the Faculty of Veterinary medicine from the University of Life Sciences "Ion Ionescu de la Brad" in Iaşi, for their support in the course and completion of their doctoral studies